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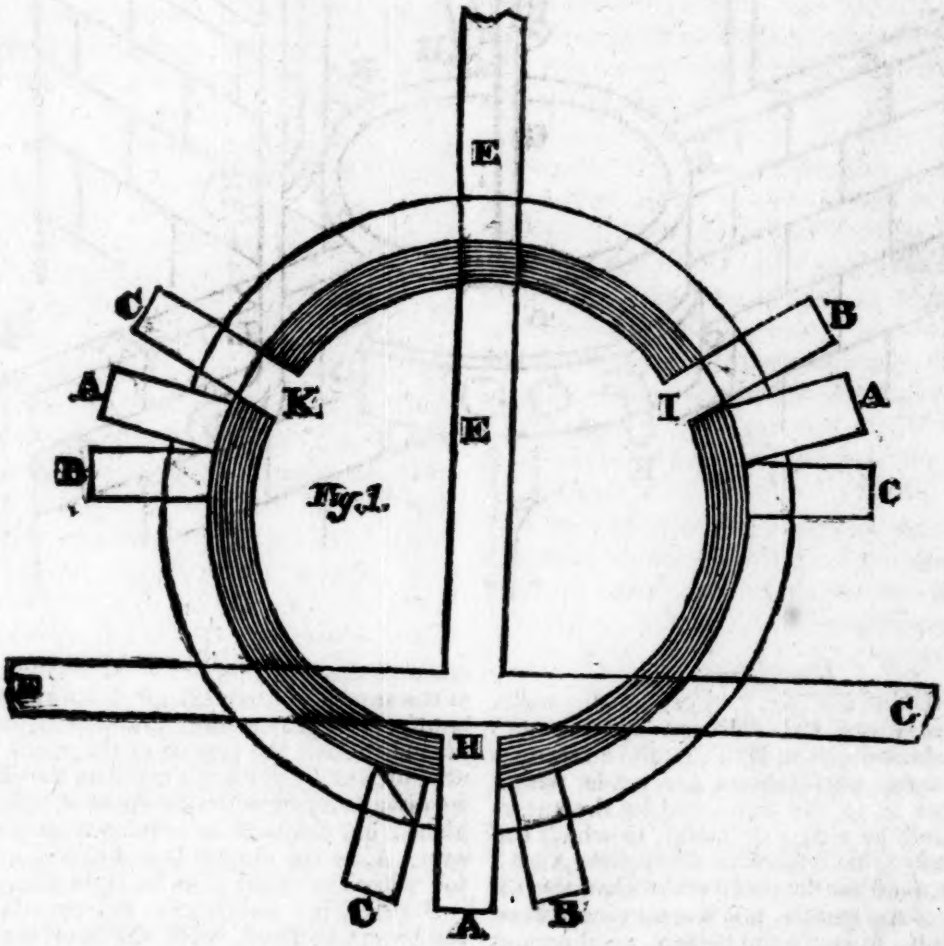
"Do not think learning in general is arrived at perfection, or that the knowledge of any particular subject in any science cannot be improved, merely because it has lain five hundred or a thousand years without improvement."—*Watts' Improvement of the Mind.*

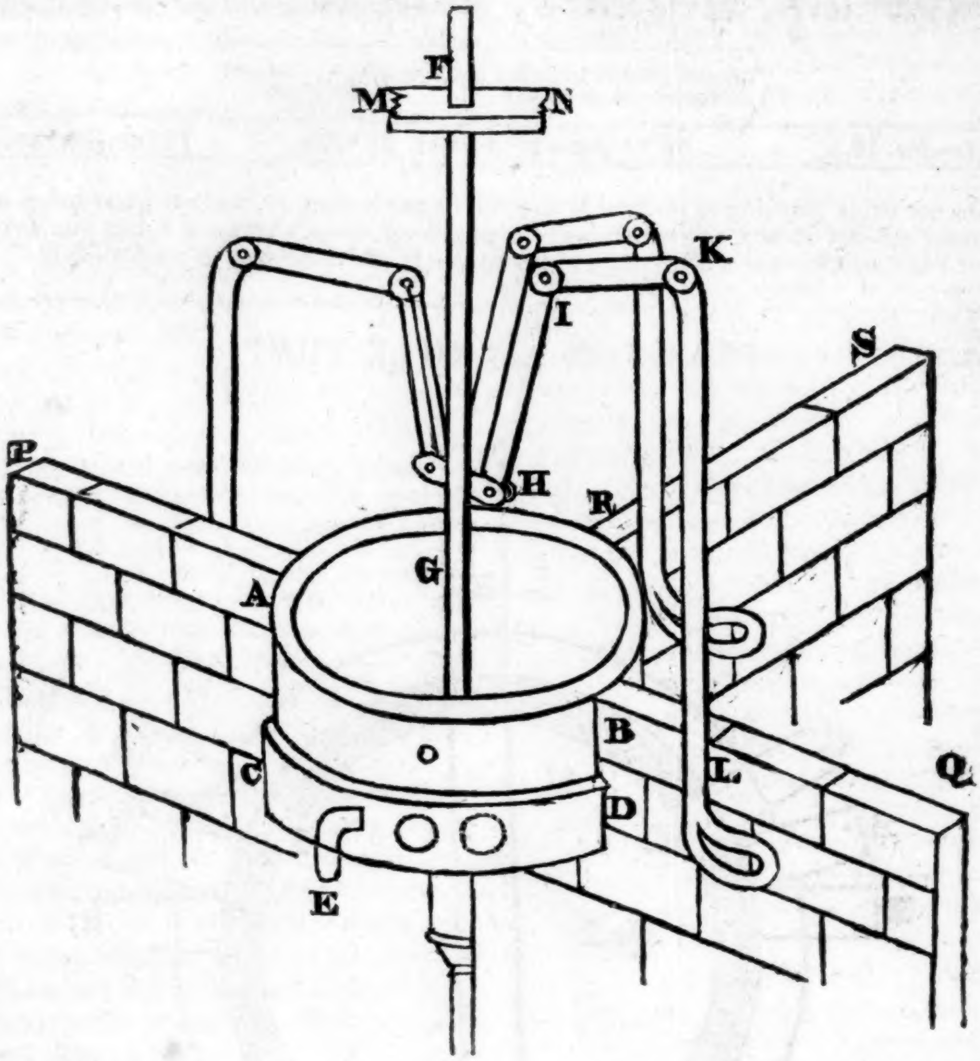
PLAN FOR A TRIPLE PUMP.



Sir,—If I understand your correspondent M. S of Lancaster, aright, when he makes his inquiries respecting a Plan for a Pump, it is that of having to supply three adjoining rooms by means of a pump, which must be so constructed, that an individual in any of the rooms shall only pump for himself; or, in other words, that the water pumped up shall only run out at the spout in his apartment.

This, I think, is not a matter of much difficulty; one plan I now send, and have been careful that it shall be as simple as I think the case admits of, and, I believe, perfectly new. If it but furnishes a *hint* to the ingenious workman, my purpose will be fully answered.

PLAN FOR A TRIPLE PUMP.—(*Fig.* 2.)



Description.

Let FG and EE, fig. 1, represent the walls which separate the different apartments; let the shaded circle, HIK, be the cistern, in which three perforations are made where the water is to run from, and let the outermost circle be a ring of metal, to which the spouts are to be affixed in the points AAA: the ring need not be much wider than the diameter of the spouts, and it must nicely fit on the cistern, towards the bottom, as shown at CD, fig. 2, and ought to be ground in the same manner that the plug of a brass cock is; that is, the working surfaces of the cistern and ring must be a portion of a cone. It is then evident that the water will not run out of the cistern but where the spout corresponds to the hole made in it; thus in the position AAA, it is evident the water will issue only from the spout A through the orifice H. Now, using the spout as a handle, turn the ring round into the position B: the orifice, H, will then be closed, and the spouts will be in the position BBB, and the water will issue through the orifice, I. In the same manner, if we move the spout to C, the water will only issue from K; thus each separate individual in the three rooms can turn the water on in his own room, and, at the same time, shut it off from his neighbour's. It will be evident that a stop must be placed to limit the motion of the spout in the arc BC; and by placing a mark on the cistern, we always know when the spout is in its right place; but this will be only necessary at the spout A, as the stop at D and C will of itself tell when the spout is in its right place.

Figure 2 is a perspective representation of the pump, as fixed, with the working part, &c.; and as all the handles work in a similar manner, it will be only necessary to show one to explain the three. PQ and RS are the two walls that separate the rooms; ABCD, the cistern of the pump, with its ring, CD, and spout E; FG is the piston rod working through a cross bar fixed at MN, thereby keeping itself always perpendicular; HIKL is one handle, IKL is in one piece (a bent lever,) working on a centre at K; the piece IH is jointed at I and H to the handle, and the projecting joint fixed to the piston rod at H; each handle is fixed in like manner; and, for the sake of the more easily working, the handle, KL (as well as all the others,) may be made to take off near K, and only fixed when wanted to pump.

Many more methods might have been shown for the working part, but this appears to me the most simple, and at the same time, the least expensive.

I am, Sir, yours, &c.

G. A. S.

RAILWAYS.*

There is no single circumstance so essential to the improvement of a country, as abundant and easy means of internal communication. Part of the price of commodities always consists of the expense of bringing them from the place where they are made or raised to the market. In improved districts this amounts, in general, only to a small percentage upon the first cost; but in rude and backward districts, unprovided with tolerable roads, it often enhances the cost of the article to three or four, or even ten times the original amount, and of course either greatly lessens or entirely precludes their use. Coal, for instance, is not found within less than a hundred miles of London; and had some more economical mode of conveyance than carting not been found out, this article which is sold at 40s. a ton in the metropolis, would have cost six pounds—a price which would have been nearly equivalent to a prohibition against the use of this species of fuel. Such are the vast facilities which navigation affords for the transportation of commodities, that the coal of Gloucestershire can be sent by sea at a cheaper rate to Jamaica, than it could be sent by land in carts to London.

In early times the roads were mere foot-tracks, and goods were universally carried on the backs of horses. To these succeeded gravelled roads for wheel carriages, and the latter were followed by canals. A horse put into a wheeled carriage will draw, upon a well-made road, as much as four horses would carry on their backs; but when employed in tracking a boat on a canal, he will perform as much work as thirty horses in carts, or as a hundred and twenty pack-horses.

*From "The Scotsman."

Railways are a much more recent invention than canals; and for particular purposes, such as the conveyance of coal, stone, or other heavy commodities, down a short inclined plane sloping at an angle of three or four degrees they are decidedly superior. As a means of general communication, they are cheaper in the first outlay than canals, more commodious in some respects, and adapted to a greater variety of situations; but so long as horse-power was the only power employed, it may be doubted whether the balance of advantage was not in favour of canals. We are quite satisfied, however, that the introduction of the locomotive steam power has given a decided superiority to railways. Indeed we are convinced, and we hope, by-and-bye, to convey some share of the conviction to the minds of our readers, that the general use of railways and steam-carriages, for all kinds of internal communication, opens prospects of almost boundless improvement, and is destined, perhaps, to work a greater change on the state of civil society, than even the grand discovery of navigation.

The value of the railway as a medium of commercial communication, has not escaped the sagacity of Dr. Young. In his lectures on natural philosophy he says: "It is possible that roads paved with iron may hereafter be employed for the purpose of expeditious travelling, *since there is scarcely any resistance to be overcome except that of the air; and such roads will allow the velocity to be increased almost without limit.*"

Iron railways are of two descriptions. The *flat rail* or *tram* road consists of cast iron plates, about three feet long, four inches broad, and an half an inch or an inch thick, with a flaunch or turned-up edge on the inside, to guide the wheels of the carriage. These plates rest at each end on stone sleepers, of three or four hundred weight, sunk into the earth, and they are joined into each other, so as to form a continuous horizontal pathway. They are of course double, and the distance between the opposite rails is from three to four feet and a half, according to the breadth of the

car or wagon to be employed. The *edge rail*, which is found to be superior to the tram rail, is made either of wrought or cast iron. If the latter is used, the rails are about three feet long, three or four inches broad, and from one to two inches thick, and they are joined at their ends by cast metal sockets attached to the sleepers. The upper edge of the rail is generally made with a convex surface, to which the wheel of the car is adapted by a groove made somewhat wider. When wrought iron is used (which is found to be equally cheap with cast metal, and greatly preferable in many respects), the bars are made of a smaller size, of a wedge shape, and twelve or eighteen feet long but they are supported by sleepers at the distance of every three feet. The wagons generally used run upon four wheels, of from two to three feet diameter, and carry from 20 to 50 cwt. Four or five of them are drawn by one horse. On the dead level railway, constructed by Mr. John Grieve for Sir John Hope, near Musselburgh, which is one of the most perfect in Britain, a single horse draws five loaded wagons, each containing 30 cwt. of coals, at the rate of four miles an hour—in all seven tons and a half, exclusive of the wagons, which weigh three tons more. Reducing the velocity to two miles an hour, by Professor Leslie's rule, the horse should draw twelve tons, or fifteen including the wagons. Mr. Stevenson observes, that "an ordinary horse, upon a well constructed railway, on a level line of draught, will work with about *ten tons* of goods." Mr. Palmer, an English engineer, gives the following as the effect of a single horse's draught, upon different railways, at two miles and a half an hour:

	Weight of the load drawn in pounds.	Weight of the load and wagon in pounds
Lanely tram road	4,602	8,850
Surrey ditto	6,750	9,000
Penryn edge rail	10,084	13,050
Cheltenham tram road	8,679	15,500
New branch of ditto, dusty	11,765	18,300
Ditto clean	14,079	21,900
Edge railways, near Newcastle	17,773	25,500

This table shows the great superiority of the edge rail. The engineer observes too, that the vehicles were made in a very rude manner, and that were more care employed in their construction, the load might be much increased. Railways are generally made double, one for going, and the other for returning. The breadth of ground required for a single railway is from nine to twelve feet; for a double one, from nineteen to twenty-five. The expense of a double road, including the price of the ground, may be estimated generally at from 3000*l.* to 5000*l.* per mile, or from *one-half* to *one-third* of the expense of a canal. Mr. Stevenson says—"The first expense of a canal will be found to be double, if not treble, the expense of a railway: such are the difficulties of passing through a well-cultivated country, and especially of procuring a sufficient supply of water in manufacturing districts, that four times the expense will in most cases be nearer the mark." (Memorial, p. 12.) We speak here of railways of the ordinary kind for the transportation of goods; but it is probable, that one destined to serve the purpose of a great national thoroughfare, for vehicles of all kinds, quick and slow, would cost at least twice as much. Even in this case, however, the original outlay would certainly not amount to more than a half or a third of what would be required for a canal of such a magnitude as to afford the same amount of commercial accommodation. The Union Canal has cost altogether about 12,000*l.* per mile; the Forth and Clyde, if executed at this day, would cost twice as much; the Caledonian Canal, if we exclude the locks, and reckon only what has been cut, will ultimately cost about 50,000*l.* per mile. Even deducting what has been expended on the locks, and on the harbours at its extremities, the expense will be nearly 40,000*l.* per mile.

A railway from Glasgow to Berwick, 125 miles long, projected in 1810, was surveyed by Mr. Telford, and estimated to cost 365.700*l*., or 2926*l* per mile. The estimated expense of a railway from Birmingham to Liverpool, distance 104 miles, surveyed within these few months, is 350,000*l* or 3365*l* per mile That of one from the Crawford Canal to the Peak Forest Canal, in Derbyshire, 32 miles long, is 150,000*l* or 4700*l* per mile. A recent Carlisle Paper states, that the expense of a railway between that city and Newcastle was estimated at 252,000., or 4000*l*. per mile; and that of a canal at 888,000*l*., or 14,000*l*. per mile. A railway projected to run from Manchester to Liverpool, 33 miles, has been estimated to cost 400,000*l*., which is no less than 13,000*l* per mile; but this includes a large amount for warehouses and locomotive engines. Lastly, a railway from Dalkeith to Edinburgh, including a branch to Fisherrow Harbour, nine miles and a quarter long altogether, will cost, according to the recent estimate of Mr. John Grieve, 36,862*l*., or 3983*l*. per mile, including the expense of five locomotive and one stationary steam engine.

Mr. Palmer, the engineer already mentioned, has proposed a new and ingenious species of railway, which deserves notice. It consists of a *single rail*, or continuous rod, of the usual form, but raised about three feet from the surface of the ground, and supported by cast metal pillars every ten feet. Two wheels with grooved edges, and 24 or 30 inches diameter, run, the one before the other, upon this railway; and from the iron frame to which they are attached by their axles, two chests or receptacles made of iron are suspended by stiff rods, exactly like panniers from the back of a horse. The chests hang very near to the surface of the ground; the load which is in those chests being so low that the centre of gravity is always beneath the level of the rail, the machine, unless very unequally loaded, has no tendency to overset. The principal advantages of this contrivance are the following:—A moderate fall of snow would produce no obstruction; it could be carried over uneven ground, and over small hollows or ravines, without cutting, embanking, or casting bridges, by merely lengthening or shortening the pillars; the lateral friction, from the want of perfect parallelism in the two opposite rails of the ordinary railway, is avoided; and in many cases the rail might even be carried along the side of a common cart-road, with a very small additional expense. Mr. Palmer, who made some trials with a portion of railway formed in this manner, states, that the effect produced by the draught of a single horse was nearly double of that produced on the common railway, or 45,000 pounds, including the vehicle. There is nothing in the nature of this machine to render steam power inapplicable to it.

(To be continued.)

ELEMENTS OF AERIAL NAVIGATION.

It is a singular circumstance in the history of the arts, that an invention at its first appearance is frequently pursued with the greatest eagerness, and yet will afterwards be wholly neglected for years, until some happy improvement fixes it permanently on the public attention. Many will remember the great zeal excited by the subject of aerial navigation among scientific men, and the astonishing subsequent neglect of an art so important, until the late revival of the subject by Sir George Cayley and other eminent philosophers.

The following statement of every thing important which has been suggested on this point, with some new views, is offered for the purpose of facilitating farther inquiries.

Vertical Motion.

1. The balloon being inflated with gas, descends by letting out a portion of it, and ascends again by throwing out ballast. To this method it is a radical objection, that the means of alternate ascent and descent are very soon exhausted.

2. The air in the balloon being expanded by heat, the vertical motion is produced by increasing or dimi-

nishing the quantity of fuel. To this method it is an objection, that the fuel will ultimately be exhausted; also, if common air be used, the balloon must be of very large dimensions to support the car; and if the air be any of the lighter gases, the expansion by heat is attended with the greatest danger.

3. The balloon being inflated with gas, another is suspended below the car, and into this the circumjacent air is forced by an easy mechanical contrivance, and is let out again at pleasure. By these means the machine descends upon increasing the density of the air, and ascends upon restoring it to its former state. This method is worthy of peculiar consideration, not being liable to the former objections, and being analogous to that contrivance of Nature, by which fishes sink at plasure, and rise again to the surface.

Lateral Motion.

1. The most obvious method of producing a lateral motion is by taking advantage of the winds. These are—occasional winds; trade winds between the tropics; the land and sea breezes, which, in warm climates, set from and towards the shore by day and night alternately; the superior currents of air, which often proceed in a direction contrary to those below; and the breezes, which commonly follow the direction of every river. To these aids we may also add the remarkable phenomenon observed by all aerial navigators, viz. that the balloon sinks lower than usual when over water, and that it has a tendency to keep the direction of a river. This circumstance may partly be attributed to the wind following the current, but principally to the specific gravity of air impregnated with aqueous vapour being diminished, and the tendency of the machine to the point of least gravity.

2. The very ingenious proposal lately made of directing a balloon, like the tacking of a ship, by means of an inclined plane, is worthy of much consideration. It is obvious that the additional weight of an inclined plane may be avoided, by forming the balloon of some figure not a sphere; thus, for instance, it may be an oblong spheroid, whose major axis is kept inclined at an angle of 45 degrees to the horizon, by means of the weight suspended in the car. But a little calculation will show that the latteral motion produced must be very small, and not sufficient to counteract any considerable wind; for the whole vertical velocity in the ascent is easily computed, and is not large; and the resolved motion in a lateral direction, being a function of the angle of inclination, is still smaller, and much less than the velocity of any gale of wind.

3. A great number of mechanical contrivances in imitation of wings and oars have been suggested, and even tried, but with a most discouraging degree of success. Upon examining the cause of these failures, it is easy to see that the experiments have been made on principles fundamentally erroneous. In the first place, the power has always been applied to the car, though it is obvious that in such a case the greatest part of the power is lost in giving the car a rotatory motion round the balloon, and that the power, in order to be entirely effective, should be applied in a line passing through *the centre of pressure of the whole system*. In the second place, the mechanism imitated has been that employed by Nature in enabling a bird to fly, though it is obvious that the animal's wings are contrived as much for *support* in the air, as for lateral motion. Our whole attention should be directed to the mechanism of fishes, whose air-bladders assimilate them to an inflated ballon, and in which the system is wholly contrived for the purposes of horizontal motion, progression being produced by the rapid vibrations of the tail, acting like a single oar upon the hinder part of a boat. When we see the rapid progress made by the salmon against the swiftest stream, we should not despair of success; and certainly not on account of the small muscular power of man if we consider that the steam-engine, with the weight of one man, commands

the power of four. It is indeed a matter of serious inquiry, whether such a machine would not require something more solid to work upon than a metalic poop, or any thing which the balloon could support. It is obvious that much advantage will be gained, if any mechanism acting on the air should move with much greater velocity than the balloon, as the resistance or power increases with the square of the velocity. It will also be a matter of experiment what form of balloon is least resisted; for the received systems on this subject are universally allowed to be erroneous, as the resistance varies as $a r^2 + b r$ (b being negative in an elastic medium,) and as it will probably be found to be a function of the figure of the body resisted.

"ART OF WEAVING."

In Mr. Murphy's excellent work on this subject a short Preface is occupied in giving an account of the origin of the Art of Weaving, and its introduction and progress in this country.

"With respect," says Mr. M. "to the processes or manipulations of weaving as conducted by the ancients, nothing satisfactory can be gathered from history, although it is highly probable that they were either the same, or similar to those at present practised by the natives of India. One thing, however, is certain from their fables and sculptures, that the Egyptians, Greeks, and Romans, spun their yarns with the distaff and spindle; and it has been remarked, that these simple implements have been used for spinning in all the countries which have been discovered by navigators for the last three centuries. They are still employed by the natives in the East Indies, and they were common in Scotland in the middle of the last century.

"That the art of weaving was unknown in Britain before the Roman invasion, at least for the purposes of clothing, will appear from the following curious picture of its inhabitants at that period, drawn by the great poet Milton. 'At Cæsar's coming hither,' says he, 'such likeliest were the Britains, as the writers of those times and their actions represent them, in courage and warlike readiness, to take advantage by ambush or sudden onset, not inferior to the Romans, nor Cassibelan to Cæsar: in weapons, arms and skill of encamping, embattling, fortifying, overmatched; their weapons were a short spear and light target, a sword also by the side; their fight sometimes in chariots, fanged at the axle with iron scythes, their bodies most part naked, only painted with woad in sundry figures, to seem terible, as they thought; but if pinched by enemies, not nice of their painting, to run into bogs up to their necks, and there stay many days, holding a certain morsel in their mouths no bigger than a bean, to suffice hunger. Their towns and strongholds were spaces of ground fenced about with a ditch, and green trees felled overthwart each other; their buildings within were thatched houses for themselves and their cattle. In peace, the upland inhabitants, besides hunting, tended their flocks and herds, but with little skill of country affairs; the making of cheese they commonly knew not; wool and flax they spun not; gardnery and planting, many of them knew not; clothing they had none but what the skins of beasts afforded them, and that not always; yet gallantry they had, painting their own skins with several portraitures of beast, bird, or flower.'

"After the Romans had obtained a footing in Britain, they established a woollen manufactory at Winchester for clothing their army, and also taught the natives the art of weaving and the culture of flax. The Saxons afterwards introduced the manufacture of several kinds of cloth, chiefly for domestic purposes; among which is said to be the weaving of counterpanes.

"Little farther is known of weaving in Britain till early in the fourteenth century, when Jack of Newbury introduced the manufacture of broad woollen cloth, which was afterwards protected and encouraged by King Edward III. and which has ever since been the staple of England. The following extracts, however, from Anderson's Progress of the Arts and Sciences, and others, will exhibit the state of the cloth manufacture in Europe from this period till the end of the seventeenth century, when a new era may be said to have commenced in the history of the Arts in Britain:—

ANNO
1209 Venice gains the silk manufacture from Greece.
1248 A company of wool merchants settle in London.
1253 Some fine linen made in England.
The latter end of this century the better sort of people wore woollen shirts; the most considerable citizens gave not above one hundred livers for a daughter's portion. But now, says Lafflamma, we wear linen. The women wear silk gowns, some of which are embroidered with gold and silver.
Table linen was scarce in England.
1305 The city of Louvain in Flanders, with the adjacent villages, were said to contain above an hundred and fifty thousand journeymen weavers.
1327 The first broad cloth made in England by Jack of Newbury.

ANNO
1331 King Edward III. resolves to promote a woollen manufactory in England, and to this end brings seventy families of Walloons into England.
1336 Two Brabant weavers settled at York with the king's protection; as it may prove, said the king, of great benefit to us and our subjects.
1337 Laws enacted for encouraging the woollen manufacture in England.
Holland gains part of said manufacture from Flanders and Brabant.
1339 Looms set up in Bristol for woollen cloth.
1348 Norwich eminent in the worsted manufacture.
French fashions introduced into England.
1351 Foreign weavers numerous in London.
1376 Woollen cloth made in Ireland.
1380 The city of Louvain loses its manufacture, by an insurrection of the journeymen weavers.
1386 A company of linen weavers established in London.
1390 Coarse cloth made at Kendal.
1398 Foreign woollen cloth first prohibited in England.
1436 Coventry eminent for the woollen and cap manufacture.
1455 Some silk manufacture carried on by women in England.
1488 Woollen cloth not to be exported until fully dressed.
1519 Spain loses her woollen manufacture, which she has not been able to regain to this day.
1521 France first gains a silk manufacture.
1533 Hemp and flax ordered by statute to be sown in England.
1537 Halifax in Yorkshire commences the woollen manufacture.
1549 King Edward VI. encourgaes foreign Protestants to settle in England, viz. Walloons, Germans, French, Italians, Polanders, and Switzers, who much advance manufactures and trade.
1567-8 Persecutions of the Protestants in France and the Netherlands, under the Duke of Alva, drive many of them into England, where they establish a variety of manufactures:
1582 Value of woollen cloth exported form England, 200,000l. annually.
1590 Manufactures of sail-cloth first introduced into England.
1597 Logwood, by law, forbid to be used in dyeing, but afterwards found to be of great use.
1608 Silk worms brought into England.
1614 Dyeing cloth in the wool first invented.
1619 Tapestry work first introduced into England.
1620 Broad silk first manufactured.
1622 The woollen manufacture in a declining state.
1624 The Dutch make woollen cloth to the amount of 25,000l. a year.
1641 Ireland spins linen yarn for Manchester, who returns it to them made into cloth.
1643 Bow dye or scarlet firt made.
1646 The French begin their manufacture of fine woollen cloth, under the patronage of Cardinal Mazarine, at Sedan
1650 The worsted manufacturers of Norwich incorporated.
1654 The fine broad cloth of England sent to Holland to be dyed.
1663 Forty thousand men, women, and children, employed in silk-throwing in and near London.
1666 Burying in woollen established by law.
1667 Dyeing and dressing woollen cloth perfected in England by one Brewer, from the Netherlands.
1668 The Scots send linen yarn to England.
1670 The wear of muslins first introduced.
The linen manufatures began to be encouraged in Ireland, where it is very considerable.
1685 Seventy thousand refugees come from France on the revocation of the edict of Nantz (by which edict the Protestants there enjoyed the public and free exercise of their religion,) and settle in Great Britain and Ireland, bringing with them the blessings of industry, and an extensive knowledge in many manufactures yet unknown there; of these two thousand are supposed to have gone to Ireland. The whole number who, for conscience sake, quitted their native country, are said to have been 800,000; they distributed themselves in Holland and Brandenburgh, where they erected the fabrics of cloth, serges, stuffs, druggets, crapes, stockings, hats, and all sorts of dyeing; and among them were goldsmiths, jewellers, watchmakers, and carvers. Many settled in Spitalfields, London, where they erected the manufacture of silk, and helped to people the suburbs of Soho and St. Giles. By them was introduced the art of making crystal, which was entirely lost to France.
1696 A law to prevent the exportation of English wool, and the importation of Irish Hemp, flax, linen, thread, and yarn from Ireland, admitted duty free. (This law gave rise to the now happy state of the linen manufacture in Ireland.)

"From these extracts it will appear, that Britain and Ireland were first indebted to the bigotry and persecuting spirit of the continental powers of Europe, in the sixteenth and seventeenth centuries, for many of the useful arts which they now enjoy, and which laid the foundation of some of our most extensive manufactures.

"The cloth manufacture made little progress in Scotland till after the Union, when it was greatly promoted by the fostering care of the Board of Trustees, which was established by charter at Edinburgh, in the year 1727, for protecting and encouraging the Scotch manufactures and fisheries. The greater part of the goods manufactured in Scotland, however, were made of linen yarn, till about the year 1759, when a branch of the sik trade from Spitalfieds, London, was established at Paisley, where it was brought to such perfection, especially in the more light and fanciful kinds, that in a short time Paisley silks not only rivalled those of the south, but had a preference in all the markets in Europe; and this laid the foundation for that extensive knowledge of fancy weaving, for which the tradesmen of Paisley have since become so famous, and which has now spread over the west of Scotland.

"About the same period, the increasing demand for cotton goods induced several individuals to attempt a more ample supply of yarn, to meet an extension of this branch of manufacture; but all without success till the year 1767, when Richard Hargreaves, a weaver in Lancashire, invented the cotton jenny, which, though at first it contained only eight spindles, was afterwards enlarged, so as to contain 20, 30, and even 80. And about two years after this invention, Sir Richard Arkwright improved the spinning of cotton still farther by the application of water for the moving power, &c. together with the addition of rollers, and other modifications of the machinery. The extension of this rising manufacture now became so rapid, that it would soon have felt a serious check, had not the discoveries in chemistry, which were made about the same time, come in to its aid, particularly in the processes of dyeing and bleaching; by the latter of which, the manufacturer was enabled, instead of a process of some months, to bring his goods to the market in the course of as many hours after they came from the loom. These inventions and discoveries, together with the improvements in calico-printing, the discharging of colours, particularly of Turkey red for Bandanas, the application of steam for the moving power, and innumerable other discoveries in mechanics and chemistry which would fill a volume to give in detail, have contributed, within the last forty years, to raise the cotton manufacture to a state of perfection and extent unknown in the history of commerce."

In the body of the work, Mr. M. proceeds to explain the Art of Weaving as it exists now in Britain at the present day, in all its branches, and furnishes such a store of facts and details respecting them, as has never yet (to our knowledge) been before the public. The heads of the different chapters will suffice to show our readers the great value and originality of the information contained in them.

Chapter I. treats of the Construction of Loom Mountings, Draughts and Cordings, Substitutes for Treadles. Chapter II. of Tweeling, Regular Tweels, Satin Tweels, Fancy Tweels, Turned or Reversed Tweeling. Chapter III. of Lind Work. Chapter IV. of Dornick and Diaper. Chapter V. of Double Cloth. Chapter VI. of the Manufacture of Corduroys, Velvets, Thicksets, &c. Chapter VII. of Crossed Warps, Gauzes, Nets, and Lappets. Chapter VIII. of Spotting, Common Spots, Paper Spots, Allover Spots, Brocades, Cut Stripes, and Seeding. Chapter IX of Flushing, Dumb Seedings, Flushed Stripes, Checks, and Borders, Flushed Nets, and Dumb Flowers. Chapter X. of compound Mountings, with their Draughts and Cordings. Chapter XI of the Draw Loom, Draw Loom Patterns, and Flower Lashing. And Chapter XII. contains Calculations and Tables connected with the Art of Weaving; such as for finding the Quntity of Weft on any number of Lashes, and at different Breadths; for showing the Quantity of Cloth on any number of Lashes at 50 and 60 Shots in an inch, &c. &c.

As a specimen of the superior style in which the work is written, and as well adapted for quotation, we shall extract part of what the author says on the subject of Pattern Drawing.

"This is perhaps the most important, as well as the most delicate department in the whole course of fancy weaving; for it is on a judicious selection and extensive variety of patterns, combined with economy in the disposal of colours, that the success of the manufacture will ultimately depend. The manufacturer, therefore, though no designer himself, should possess a complete knowledge of drawing, or at least of hand sketching. This would not only improve his taste, but would enable him, when any new or striking objects occurred, to communicate his ideas with precision to the pattern drawer, and to make a more tasteful selection from the productions of others. This is, in general, the case in France, and the consequence is, that French patterns are usually distinguished for the ease and elegance of their style, while the greatest economy is observable in the use of the materials of which they are manufactured.

"On the other hand, the qualifications of a pattern drawer, who would excel in his profession, are by no means of a superficial nature. A facility in sketching or delineating any object that may present itself, whether natural, artificial, or imaginary,

combined with a thorough knowledge of the principles of weaving, at least with those branches with which he is more immediately connected, are indispensable requisites. The pattern drawer, like the poet and the painter, ought to possess an unlimited fancy, and a strong and lively imagination; to be deeply impressed with the beauties and charms of Nature; and to be able to draw from thence the principal effect of his designs. A chaste taste also is as necessary in the pattern drawer as in the manufacturer, and this will be greatly heightened and improved by a little knowledge of geometry, particularly of symmetry and proportion; for nothing can be more offensive to a person of genuine taste, than a pattern or picture crowded with an incongruous assemblage of distorted objects.

"The first attempts of a learner in this art should therefore be to acquire a facility in sketching a variety of simple objects, such as straight lines, circles, ovals, and other curved figures. After he has made some progress in these exercises, he may proceed with copying from good sketches, particularly, at first from the most simple specimens of that kind of patterns to which his attention is to be afterwards directed. It must, however, be observed, that when he has attained as much practice as enables him to sketch from his own fancy, he should be very cautious at first, both with respect to the objects which he selects for his designs, and the manner in which they are to be disposed; for on his taste and judgment in making these experiments will depend, in a considerable degree, his peculiar style afterwards. He will therefore derive much advantage, in the early stages of his progress, by procuring as great a variety of appropriate objects for his patterns as possible, such as leaves, flowers, fruits, shells, &c. which may be copied either from drawings or the originals; and from this fund he will afterwards, with a little modification of their forms, be able to give a considerable diversity to his designs; at the same time he ought to avoid, as much as possible, a certain sameness of style, which is sometimes found in the productions even of the best drawers.

"Harness patterns are, in general, first drawn on common paper, of the same size that they are to occupy on the cloth, which is ascertained by taking their dimensions from a reed scale, and these are denominated sketches. For patterns which are to be all white, the sketches may be finished with a black lead pencil, either shaded or not, as the pattern drawer may find occasion. In drawing sketches for allovers, or other kinds of running patterns, particular care must be taken, where the stalks or other members join, to avoid stiffness or unnatural turns, and to observe that none of the parts be too much crowded, nor improper vacancies left. At these joinings, the stalks, &c. may be continued beyond the limits of the sketch until they be completed, or until their curvatu res or bendings be accurately ascertained, and then transferred by means of a bit of spare paper to the opposite side of the pattern.

"For coloured patterns, a rough sketch is commonly drawn out on coarse paper, which, after all the necessary corrections are made, is traced on clean drawing paper, when it is ready for colouring. The method of tracing these sketches is as follows:—Prepare a sheet of wove writing paper by rubbing it over on one side, first with sweet oil, and afterwards with ground verditure; when it is dry, lay it on the clean drawing paper, and over it the rough sketch. Then with a blunted steel point trace over all the outlines, and a very fine delineation of the pattern will be produced. This done, the different colours are laid on with camel's hair pencils, agreeably to the taste of the manufacturer, or to the style of work to which the patterns are to be applied. It is necessary to observe, however, that, as in many kinds of patterns, particularly those intended for low priced goods, the greatest economy is frequently necessary in introducing the colours, the pattern drawer's chief study should be to produce as much effect with as few colours as possible.

"Pattern drawers have also frequent occasion to copy extensive patterns from the cloth, such as coloured shawls, pine plaids, &c. This is easily effected by laying a sheet of transparent paper over the pattern to be copied, through which every object and colour will be distinctly seen, and traced with a black lead pencil: it may be afterwards transferred to a sheet of clean drawing paper, by means of a tracing paper and steel point, and coloured in the same manner as the original. For present use, a sheet of silk or tissue paper may be brushed over with sweet oil until it be all thoroughly wet, and when dry it will be fit for use. But as this paper will soon turn dim by exposure to the air, the following recipe has been recommended in the Panorama of Arts:—'Take one quart of the best rectified spirits of turpentine, and put to it a quarter of an ounce of the sugar of lead finely powdered; shake it up, and let it stand a day and a night; then pour it off, and add to it one pound of the best Canada balsam; set it in a gentle sand heat, and keep stirring it till it is quite mixed, when it will be fit for brushing over the paper, which in about four days will be fit for use. The paper rendered transparent is that which stationers call bank post; but when great nicety is required, tissue paper, which is still thinner, will be proper. Before it is brushed over with the mixture, after having been made damp by laying it over another damp sheet of stronger paper, it should be pasted by the edges upon a frame, and suffered to dry.'

"The pigments used by pattern drawers and designers, are, in general, the same as those which are made up into cakes, and sold in shops under the name of water colours. In water colour paintings, however, such as flowers, landscapes, &c. the pigments employed are chiefly the transparent kind, and the different shades are wrought up by repeated touches of the pencil, till they have acquired their full effect: but in the sketches for patterns, the colours must be all opaque, or of such a body as may be easily laid on the paper with only one touch of

the pencil, and at the same time stand distinct, without allowing one to appear through or blend with another. Colours, therefore, which are naturally transparent, must be made opaque, by mixing with them a little flake or other fine white.

"The colours used for designing, however, ought to be rather of a semi-transparent nature, that they may not only work freely and expeditiously with the pencil, but that the flower-lasher may be able to see the lines of the design-paper distinctly through them. Some of the London designers have indeed carried this idea so far as to have their design-paper transparent, and to paint the pattern on the back with opaque or body colours.

"In drawing sketches for most kinds of harness patterns, it is of considerable importance that the colours on the sketch be adapted, as nearly as possible, to the tints of the materials of which they are to be fabricated on the cloth. This would often prevent disappointment in the manufacturer, who, without considerable experience, is liable to be deceived by a brilliant display of colouring on the sketch, which cannot be realized in the loom; and this is more particularly the case in the cotton manufacture, which does not admit of such a beautiful variety of tints as either silk or worsted.

"Pattern drawers, therefore, generally prefer colours of their own preparation to those sold in cakes, not only on account of economy, but that they can more easily obtain those tints, and of that consistence, which this species of drawing requires.—For these reasons, it may not be improper here to introduce a list, with some useful remarks, of those pigments which are most commonly employed in water colour painting, leaving to the artist the choice of those which may seem best suited to that branch of manufacture in which he is more immediately engaged.

"The principal colours used in water painting are yellow, orange, brown, red, purple, blue, green, black, and white: of the seven first of which there is a great variety of shades, besides their compounds."

The illustrative plates, engraved by Mr. Maclure, from drawings furnished by the author, contain nearly two hundred and fifty different figures, executed with great clearness and accuracy, and serve to render the work altogether one of unrivalled utility to our cloth manufacturers of every description.

BURSTING A HOGSHEAD.

It is justly affirmed by some writers on natural philosophy, that a certain quantity of water, however small may be rendered capable of exerting a force equal to any assignable one, by increasing the height of the column and diminishing the base on which it presses. Dr. Goldsmith observes, that he has seen a strong hogshead split in this manner A small but strong tube of tin, twenty feet high, was inserted in the bunghole of the hogshead. Water was then poured into the tube till the hogshead was filled, and the water had reached within a foot of the top of the tin tube. By the pressure of this column of water, the hogshead burst with incredible force, and the water was scattered in every direction.

IRON MAKING.

Mr. Mushett, one of the most scientific and ingenious of our iron masters, has, in some late inquiries into the history of the discovery and use of cast iron, appeared disposed to fix its date in England about the year 1550; before which time it appears that the art of casting iron was unknown, and he supposes it to have been an English invention.

There were in England and Wales, in the year 17.0, he says, fifty-three blast-furnaces employed in making 17,350 tons yearly, or a little more than five tons of pig-iron each weekly. At that period fourteen of these furnaces existed in the two south-eastern counties of England, Kent and Sussex, where now one, at most, survives, near Battle.

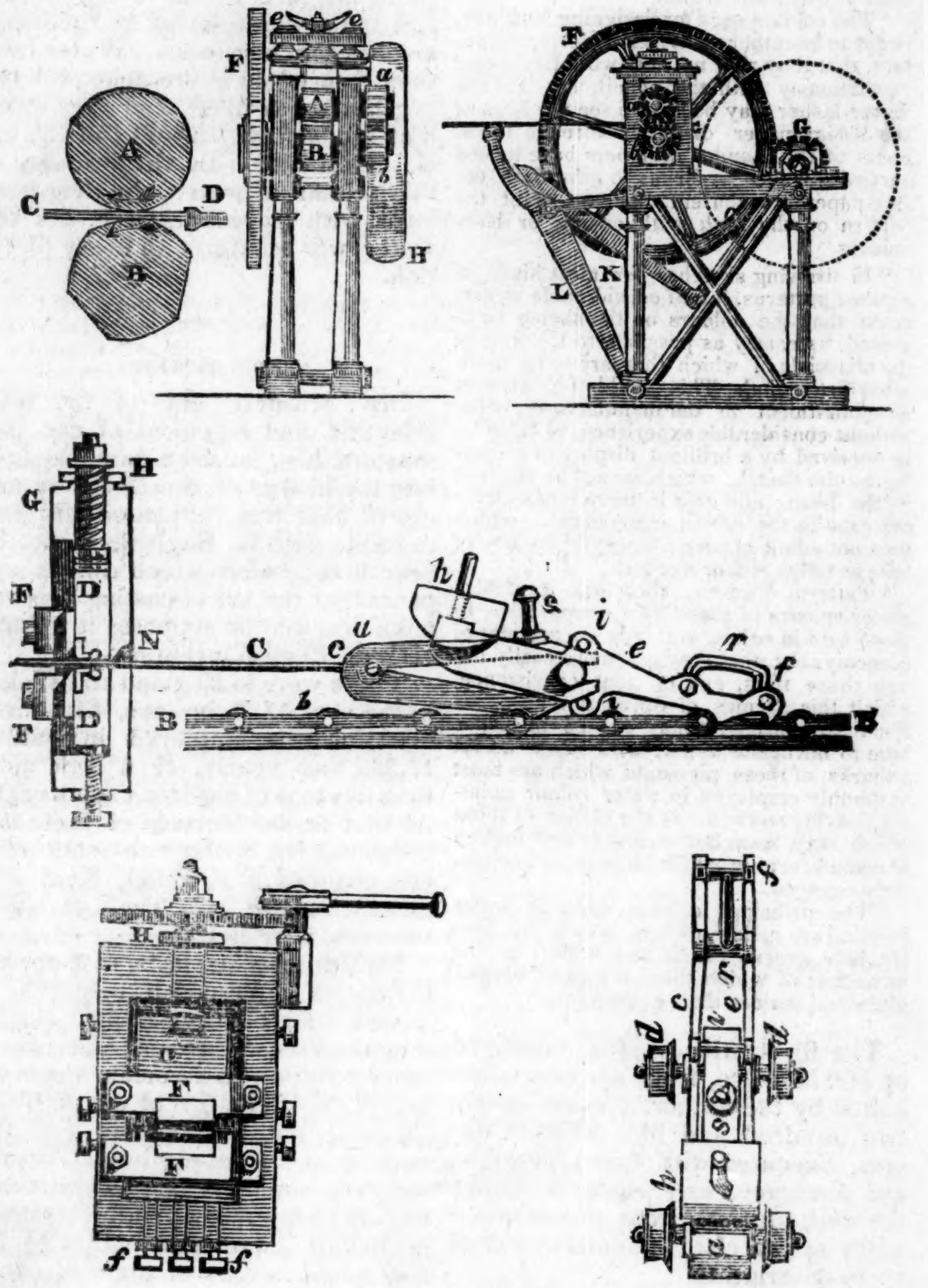
Mr. Mushett suggests, as a curious matter of antiquarian research in Sussex and Gloucestershire (including the Forest of Dean,) and several other counties, to ascertain the date and place of erection of the first tall blast-furnace in England for the making of cast or pig iron. At present the size and numbers of these furnaces are so wonderfully increased in Britain as to manufacture nearly *half a million tons* of pig-iron annually,* with a consumption of pit coal, in all the attendant manipulations, equal, at least, to *five million tons* annually.

T. M. B.

* We suspect this calculation has not been recently made. The amount of the manufacture for the present year is certainly much greater.

PROCESS OF COINING AT THE ROYAL MINT.

(Continued from No. 7.)



PROCESS OF COINING AT THE ROYAL MINT.

The drawings given with our present Number are descriptive of a new machine invented by Mr. Barton, and employed at the Royal Mint for drawing the slips of metal between dies, by which a greater degree of accuracy and uniformity is obtained in the thickness of the metal. The operation is similar to wire-drawing.

The first, second, and third of the preceding figures, represent a small machine for thinning the ends of the slips of metal, so that they will enter into the dies through which the whole of the slip is to be drawn. It is a small pair of rollers, which are shown on a large scale in figure 1st. A is the upper roller, and B the lower; this has three flat sides, as represented: C is the slip of metal put between the rollers; D is a stop, adjustable in the line of the motion of the slip of metal, C. The second figure is an end view, and the third a side view, of the frame or machine in which the rollers are mounted. A B are the rollers, which are made to turn together by pinions, *a b*. F is a large cog-wheel, which is fixed on the end of the axis of the lower roller. This cog-wheel is turned by a pinion, G, which is fixed on an axis extending across the machine, and having a fly-wheel fixed on one end, and at the other a drum, H, to receive an endless strap, by which the machine is put in motion; a crank is formed on the middle of this axis, and a rod, *d*, is joined to the crank, to connect it with the moving blade, K, of a pair of shears, of which the other blade, L, is fixed to the frame. The distance of the rollers is regulated by a screw, *ee*, at the top of each standard. These screws have pinions at the top of them, and are turned round by a pinion, which is placed between them, and engages the teeth of both pinions, so as to give motion to the two screws at the same time, when the middle wheel is turned round by a cross handle which is fixed to the top of it. If the slips of metal which are to be put into this machine are not exactly square at the ends, they are cut off smooth and square by the shears, which keep constantly moving; the end of the slip is then presented between the rollers, not on that side which would draw them in between the rollers, as in common rolling, but on the opposite side; when one of the flat sides of the lower roller comes opposite the upper roller, then the piece of metal can be pushed forwards between the two until the end stops against the stop D, as in fig. 1st.; then, as the rollers turn round, and the flat side of the lower roller passes by, the cylindrical parts of the roller will take the metal between, and roll it thinner at the end which is between the stops and the point of contact of the rollers.

Figures 4 and 5. A section, to show how the slip of metal, C, is drawn between the dies, fig. 4, by the tongs, fig. 5. The dies are two cylinders of steel, made very hard, and extremely true; these are fitted into two sliders, D D, and are held fast by clamp pieces screwed against them. The steel cylinders are very accurately fitted into their beds in the slides, so that the steel shall be firmly supported, and prevented from bending or turning round, and presenting but a small portion of their circumference against the slip of metal. The sliders, D D, are fitted into a box, figures 4 and 6; they fit flat on the bottom of the box, and two clamps, F F, are screwed against the sliders, to confine them to the box. The lower slider is supported by two screws, *f f*, and the upper slider is forced down by a large screw, G; this has a cog-wheel fixed on the top of it, with a pinion and lever to turn the screws round very slowly, and regulate the distance between the dies. H is a clamping nut, fitted upon the screw, to take off all possibility of shake; the sliders also are bound fast sideways by screws tapped through the sides of the box, the points of which press upon steel plates between them and the sliders. In order to render the contact between the points of the screws, supporting the under side, and the point of the adjusting screw, forcing the upper slider, still more complete, two extending screws are introduced at the ends of the steel dies between the sliders, by which a sufficient degree of contact to overcome the spring of the materials may be excited before the dies come into action on the slip of the metal.

Our Artist has in hand, for next Number, a perspective view of the drawing-machine at work, The box of dies is fixed at one end of a long frame. This frame supports two axes, A A, one at each end. Upon these axes wheels are fixed, to receive endless chains, B B, which move along a sort of trough or railway, formed on the top of the frame. The chains are kept in motion by a cog-wheel, C, which is fixed upon the axis most remote from the box of dies. This cog-wheel is turned by a pinion, D, on the axis of which is a wheel E; and this wheel is turned by a pinion F, on the axis of the drum G, which is moved by an endless band, proceeding from some of the wheels in the mill, and which is thrown in and out of geer at pleasure by a tightening roller. The slip of metal is drawn through the dies by the chain, with a pair of tongs.

Figures 5 and 7—*a b* are the two jaws of the tongs, which are united with each other by the joint pin *c*. This has a small roller or wheel fitted on each, and to run upon the railway or top of the frame; *d d* are a similar pair of wheels, the axle of which is connected with two links *e e;* this axle passes between the tails of the tongs, but is not fixed to them. The ends of the links have a double hook formed on them, as shown at figure 5. The tongs run upon their wheels immediately over the endless chain, so that when the end of the links, *e e*, is pressed down, one of the hooks catches on a cross pin of the chain, as in figure 5; the axle of the wheel *d d*, acting between the inclined parts of the tails of the tongs, tends to throw them asunder, and, at the same time, the jaws of the tongs bite with very great force; the links *e e* draw the tongs along with the chain B B. The links are carried a long way beyond the axle of the wheels, and have a sufficient weight, *h*, fastened to them which will lift up the hooked end *f*, and disengage it from the chain, except when there is a considerable strain on the tongs.

To use this machine, a boy takes hold of the tongs by the handle *r*, when they are disengaged from the chain, and pushes the tongs forward to the box of dies. The tongs run freely upon their wheels, and the jaws open when moved in that direction, because two small pins, *i i*, are fixed between the

links, and acting on the outsides of the tails of the tongs, close them together, and this at the same time opens the jaws. The tongs are pushed up close to the box of dies, and the jaws enter into a recess N, figure 4, which is formed for that purpose. Another boy takes a slip of metal, which is previously made thin by the rollers, figure 1, and introduces it between the dies, and also between the jaws of the tongs, which are open. The boy who holds the tongs now takes the handle *s*, which is fixed on the back of the tongs, and holds it fast, whilst with the other hand he draws the handle *r*, at the end of the links, away from the tongs. This has the effect of closing the jaws of the tongs upon the slip of metal between them; at the same time the boy depresses the handle *r*, and the hook at the end of the links, *e e*, will be caught by the first cross-pin of the chain which comes beneath them. This puts the tongs in motion; but the first action is to close the jaws, and bite the piece of metal with great force, in consequence of the axletree of the wheels being placed between the inclined planes of the tongs. When the tongs have closed on the metal with all their force, they move with the chain, and draw the slips of metal through the dies which, operating upon the thicker part of the slip with greater effect than upon the thin, reduces the whole to an equal thickness. When the whole is drawn through, the strain upon the tongs is gradually released; and the weight lifting up the hook at the other end of the links, they are ready to be advanced again to the die, to draw another bar. The frame, of which we are to give a drawing in our next Number, contains two pair of dies, and the same wheel serves for both. At the Mint there are two machines of this description: they are placed side by side, with a sufficient space for the boys to work between them. These machines were made by Mr. Maudsley, under the direction of the inventor.

The slips of metal produced from this machine are considerably more uniform in thickness than when finished at the adjusting rollers; consequently the individual pieces are made more nearly to the standard weight, which was the object in view by this invention. This has become a point of great importance in the practice of the Mint, from the remedy on gold in weight being reduced from 40 to 12 Troy grains. When the pieces cut from slips of metal prepared from the drawing machine are pounded and weighed, which is telling the number of pieces in a pound Troy, sovereigns or half sovereigns, the variations from standard either way seldom exceed three grains Troy. It is reckoned good work from the adjusting rollers when the variations are under six Troy grains.

(To be continued.)

MUSICAL BAROMETER.

A GENTLEMAN at Burkli, by the name of Ventain, not far from Basle, in Switzerland, invented some years ago, a sort of musical barometer, which has been called in German, *wetter harfe*, weather harp; or *riesen harfe*, giant harp, which possesses the singular property of indicating changes of the weather by musical tones. This gentleman was in the habit of amusing himself by shooting at a mark from his window, and that he might not be obliged to go after the mark at every shot, he fixed a piece of iron wire to it, so as to be able to draw it to him at pleasure. He frequently remarked that this wire gave musical tones, sounding exactly an octave, and he found that any iron wire, extended in a direction paralel to the meridian, gave this tone every time the weather changed. A piece of brass wire gave no sound, nor did an iron wire extended east and west. In consequence of these observations a musical borometer was constructed. In the year 1787, Captain Haas, of Basle, made one in the following manner: Thirteen pieces of iron wire, each 320 feet long, were extended from his summer-house to the outer court, crossing a garden. They were placed about two inches apart; the largest were two lines diameter, the smallest only one, and the others were about one and a half. They were on the south side of the house, and made an angle of 20 or 30 degrees with the horizon They were strengthed and kept tight by wheels for the purpose. Every time *the weather changes*, these wires make so much noise that it is impossible to continue concerts in the parlour, and the sound sometimes resembles that of a tea-urn when boiling, sometimes that of an harmonica, a distant bell, or an organ. In the opinion of the celebrated chemist Mr. Dobereiner, as stated in the *Bulletin Technologique*, this is an electro-magnetical phenomenon. Do any of our readers know of such an instrument having ever been tried in Britain?

ELECTRICITY BY WATER FREEZING.

WHEN water is frozen rapidly in a Leyden jar, the outside coating not being insulated, the jar receives a feeble electrical charge, the inside being positive and the outside negative. If this ice be rapidly thawed, an inverse result is obtained; the inside becomes negative and the outside positive.

ON THE COMPARATIVE VALUE OF OIL AND COAL GAS.

(*Abridged from the Edinburgh Philosophical Journal.*)

THE author of this Paper, Dr. Fyfe, who is Lecturer on Chemistry at the School of Arts in Edinburgh, begins by stating, although much apprehension was excited on the first introduction of gas lighting, by the necessary large collections of an explosive gas, that only one gas holder has been blown up since the practice was generally introduced; and this took place at Manchester in the infancy of the art, and was occasioned by a workman applying a lighted candle to the part whence gas was issuing and mixing with atmospheric air. A few accidents have occurred by the gas escaping from the pipes, but these have also in general been owing to carelessness. Shops and apartments are not close enough to keep the gas confined; and even if they were, the quantity which can escape is too trifling, compared to the quantity of air in the apartment, to occasion any mischief Coal gas is most explosive when mixed with about five parts of air. It would be therefore requisite, in a room which contains 1728 cubic feet, lighted by a stream of gas, consumed at the rate of five cubic feet in an hour, that the burner should be left open upwards of fifty hours before the mixture becomes explosive. When coal gas is used, its offensive odour gives warning of its escape; so that one of its most noxious qualities is a valuable safeguard.

THE INGREDIENTS FOUND IN OIL AND IN COAL GAS, when sent into the pipes for burning, and after both gases have been purified, are, or ought to be the same, but they exist in somewhat different proportions. The following tables, the first by Dr. Henry, the second by Dr. Fyfe, show these different ingredients and their proportions. The gas is first subjected to the action of chlorine, which condenses a certain portion, supposed to be partly olefiant gas and partly a volatile oil.

Coal Gas.

The following table is the result of experiments, made on five kinds of coal gas, prepared from Wigan Canal Coal. The three first were collected from an opening of the pipe between the retort and the tar pit, half an hour after the commencement of distillation, No. 4 was taken five hours, and No. 5 ten hours after the beginning. The carbonic acid and sulphuretted hydrogen were removed by washing the gas with a solution of potassæ.

After being condensed by chlorine, 100 parts contained,

Gas.	Specific Gravity.	Condensed by Chlorine.	Azote.	Carburetted Hydrogen.	Carbonic Oxide.	Hydrogen.
No. 1	650	13 per cent.	1.5	94.5	4	0
2	620	12	6	82	2	10
3	630	12	2	66	14	18
4	500	7	5	60	12	26
5	345	0	10	20	10	60

Oil Gas.

The gas, Nos. 1, 2, 3, was procured from whale oil, previously boiled, to free it from water, the heat of the retort being reduced at each succeeding experiment, till it was just sufficient to decompose the oil.

After being condensed by chlorine, 100 parts contained,

Gas.	Specific Gravity.	Lost by Chlorine.	Azote.	Carburetted Hydrogen.	Carbonic Oxide.	Hydrogen.
No 1	464	6 per cent.	7	30	15	48
2	590	19	5	40	15	40
3	758	22.5	5	65	20	10
4	906	38	5	75	15	5

The reader will see that, in the best specimen of oil gas, the carbonic oxide is in greater proportions than in the best specimens of coal gas, and in the latter the carburetted hydrogen is most abundant. The hydrogen in both appears to increase, as the temperature at which they are formed becomes higher, and is always greatest in the last portions.

THE QUANTITY OF GAS OBTAINED FROM COAL AND FROM OIL, varies according to the nature of the material and the manner of treating it. The author quotes from various writers the following statement of the quantity of gas obtained from two hundred species of coals:—

Wallsend, about	750 cubic feet
Parrot	860
Lesmahago . .	1080
Newcastle . .	1080
Wigan Orral .	700
Cannel (doubtful)	1200

From which 1000 feet are taken as the average of the quantity of gas which ought to be obtained from good coal. The quantity of gas obtained from oil varies from 97 to 120 feet, whence it is stated, that 100 feet may be considered as a fair estimate of the quantity of gas usually obtained from a gallon of oil. Dr Fyfe says, that if the oil be allowed to flow into a retort brought just to a red heat, there is comparatively little gas, but a great deal of volatile oil. When the retort is made intensely hot, lamp black is formed in considerable quantities. In both these modes then the oil may be wasted to a considerable extent; and it seems to be decomposed most advantageously when the retort is brought to a full red heat.

(To be continued.)

LARGE AND SMALL HORSES.

Animals draw by their weight, and not by the force of their muscles. The hind feet form the fulcrum of the lever, by which their weight acts against the load, and the power exerted, is always proportioned to the length of the lever, the weight remaining the same. Large horses, therefore, and other animals, draw more than small ones, even though they have less muscalar force, and are unable to carry such a heavy burden. The force of the muscles tends only to make the horse carry continually forward his centre of gravity, or, in other words, the weight of the animal produces the draught, and the play and force of its muscles serve to continue it.

GOLD LEAF.

It requires three hundred thousand of such gold leaves as are commonly used in gilding to make an inch in thickness. The tenuity of Gold Leaf is so great that it is, in some measure, trasparent. When it is interposed between the eye and external objects, they are distinctly perceived, of a greenish colour.

SINGULAR PROPERTY OF THE BALANCE.

The following curious property of the Balance is mentioned by Helsham. If a man, placed in one scale, and counterpoised by a weight in the other, press the beam upwards, he will thus cause the scale in which he stands to preponderate; or if he pull it down it will cause it to rise.

C. D.

HOW TO FIND THE MAGNIFYING POWER OF TELESCOPES.

Put up a small circle of paper, an inch or two in diameter, at the distance of about an hundred yards; draw upon a card two black parallel lines, whose distance from each other is equal to the diameter of the paper circle. Then view through the telescope the paper circle with one eye, and the parallel lines with the other, and let the parallel lines be moved nearer to or farther from the eye till they seem exactly to cover the small circle viewed through the telescope. The quotient obtained by dividing the distance of the paper circle by the distance of the parallel lines from the eye, will be the magnifying power of the telescope. A little practice is necessary before this experiment can be made with accuracy.